Amendments to the Claims

The listing of claims will replace all prior versions, and listings of claims in the application.

1. (Previously Presented) A communication device for communicating data through a data channel, the communication device comprising:

a. a data transformer operably coupled with the data channel, the data transformer manipulating the data between data bits, a data bit vector, and a transmission symbol, the data bit vector having a selectable predetermined integer number of data bits, the transmission symbol containing a selectable integer number of the data bit vectors; and

b. a controller operably coupled with the data transformer, the data transformer being responsive thereto, the controller adaptively selecting the selectable predetermined integer number of data bits, and the selectable integer number of data bit vectors to communicate the data through the data channel at a predetermined data bit rate in response to a data channel condition,

wherein the transmission symbol includes a selectable integer plurality of data bit vectors, each of the selectable integer plurality of data bit vectors having one of a first predetermined integer number of data bits and a second predetermined integer number of data bits represented therein, and

wherein the data transformer, responsive to the controller, reversibly groups ones of the first predetermined integer number of data bits into selected ones of the selectable integer plurality of data bit vectors and ones of the second predetermined integer number of data bits into selected others of the selectable integer plurality of data bit vectors in the

response to the data channel condition, the selectable integer plurality of data bit vectors forming at least one data symbol corresponding to a predetermined pattern being representative of a preselected signal constellation.

2. (Original) The communication device of claim 1, wherein the transmission symbol is comprised of one data bit vector having one of a first predetermined integer number of data bits and a second predetermined integer number of data bits represented therein.

Claims 3 and 4 (Cancelled).

5. (Previously Presented) The communication device of claim 1 wherein the data transformer selects successive ones of a plurality of data symbols according to one of a preselected coding method and an unencoded method, in the response to the controller, the controller being responsive to the data channel condition.

6. (Original) The communication device of claim 5 wherein the data transformer dynamically selects a predetermined correlation between successive ones of the plurality of data symbols in the response to the controller, the controller being responsive to the data channel condition.

7. (Original) The communication device of claim 5 wherein the data transformer continuously selects a predetermined correlation between successive ones of the plurality of data symbols in the response to the controller, the controller being responsive to the data channel condition.

8. (Original) The communication device of claim 5 wherein the data transformer selects a predetermined correlation between successive ones of a plurality of transmission symbols in the response to the channel condition, according to a preselected coding method.

9. (Original) The communication device of claim 5, wherein the preselected coding method is constellation-multiplexed coding.

10. (Original) The communication device of claim 8, wherein the preselected coding method is constellation-multiplexed coding.

11. (Original) The communication device of claim 1, wherein the data channel condition comprises at least one of received power, signal-to-noise ratio, and an input from a master control.

12. (Original) The communication device of claim 1, wherein the controller is responsive to the data channel condition in a preselected domain.

13. (Original) The communication device of claim 12 wherein the data channel condition comprises at least one of received power, signal-to-noise ratio, and a control master signal.

14. (Original) The communication device of claim 12, wherein the preselected domain comprises one of a time domain and a frequency domain.

15. (Original) The communication device of claim 13, wherein the preselected domain comprises one of a time domain and a frequency domain.

16. (Original) The communication device of claim 13, wherein the signal-to-noise ratio comprises one of transmitted power, channel attenuation, noise, and interference.

17. (Original) The communication device of claim 1, wherein the predetermined data bit rate is at least one of a non-power of two and a non-integer.

18. (Original) The communication device of claim 17, wherein the transmission symbol is representable by a plurality of symbol constellations.

19. (Original) The communication device of claim 8, wherein the communication device is a transmitter, the data transformer imparts the predetermined correlation between the successive ones of the plurality of data symbols, the predetermined data bit rate is at least one of a non-power of two and a non-integer, the transmission symbol is representable by a plurality of symbol constellations, and the preselected coding method is constellation-multiplexed coding.

20. (Original) The communication device of claim 19, wherein the data transformer further comprises:

a. a bit parser grouping ones of the first predetermined integer number of data bits into selected ones of the selectable integer plurality of data bit vectors and ones of the second predetermined integer number of data bits into selected others of the selectable integer plurality of data bit vectors, the bit parser being governed by the controller; and

b. a constellation mapper mapping the at least one data symbol into the transmission symbol, the constellation mapper mapping in response to the controller, the controller being responsive to the data channel condition.

21. (Original) The communication device of claim 20, further comprising an encoder operably interposed between the bit parser and the constellation mapper, the encoder encoding, in the response to the controller, the at least one data symbol into the transmission symbol and imparting the predetermined correlation thereupon, the controller being responsive to the data channel condition.

22. (Original) The communication device of claim 21 wherein the encoder is a convolutional encoder.

23. (Original) The communication device of claim 20 further comprising a bit buffer operably connected with the bit parser and the constellation mapper for buffering a selectable group of data symbols.

24. (Original) The communication device of claim 23, further comprising an encoder operably interposed between the bit buffer and the constellation mapper, the encoder encoding, in the response to the controller, the selectable group of data symbols into the transmission symbol and imparting the predetermined correlation thereupon, the controller being responsive to the data channel condition.

25. (Original) The communication device of claim 24 wherein the encoder is a convolutional encoder.

26. (Original) The communication device of claim 8, wherein the communication device is a receiver, the transmission symbol is representable by a plurality of symbol constellations, the data transformer detects the predetermined correlation between the successive ones of the plurality of transmission symbols and extracts the selectable predetermined integer number of data bits thereby, the predetermined data bit rate is at least one of a non-power of two and a non-integer, and the preselected coding method is constellation-multiplexed coding.

27. (Original) The communication device of claim 26, wherein a received signal includes a transmission symbol and channel noise imposed thereupon, and the data transformer further comprises:

a. a noise estimator, operably connected with the data channel and governed by the controller, estimating a noise metric associated with the transmission symbol; and

b. a sequence estimator, operably connected with the noise estimator and governed by the controller, detecting the predetermined correlation between the

transmission symbols and the selectable predetermined integer number of data bits, and using the noise metric to filter the channel noise from the received signal, extracting the transmission symbol thereby.

28. (Original) The communication device of claim 27, wherein the sequence estimator comprises a maximum likelihood sequence estimator.

29. (Original) The communication device of claim 28, wherein the maximum likelihood sequence estimator comprises a Viterbi decoder.

30. (Original) The communication device of claim 28, wherein the data transformer further comprises a constellation demapper for demapping the transmission symbols into the selected number of data bits, the demapper being operably connected with the maximum likelihood sequence estimator and governed by the controller.

31. (Original) The communication device of claim 26, wherein the received signal is a modulated received signal, and wherein the data transformer further comprises a demodulator operably connected with the data channel, the noise estimator, and the sequence estimator, and governed by the controller, the demodulator restoring at least a portion of the transmission symbols from the modulated received signal.

32. (Original) The communication device of claim 27 wherein the sequence estimator employs soft-decision decoding to detect the predetermined correlation.

33. (Original) The communication device of claim 32, wherein the received signal has a trellis encoding superimposed thereupon, and the soft-decision decoding includes finding a path through the trellis encoding with a minimum-weighted-squared-Euclidean distance to the transmission symbol from the received signal.

34. (Original) The communication device of claim 31, wherein the demodulator further performing a correlative-level decoding.

35. (Original) The communication device of claim 34, wherein the correlative-level decoding includes a partial-response decoding.

36. (Original) The communication device of claim 5 wherein the data transformer dynamically selects successive ones of the plurality of data symbols in the response to the controller, the controller being responsive to the channel condition.

37. (Original) The communication device of claim 5 wherein the data transformer continuously selects successive ones of the plurality of data symbols in the response to the controller, the controller being responsive to the channel condition.

38. (Original) The communication device of claim 5 wherein the data transformer selects successive ones of the plurality of data symbols in the response to the data channel condition, according to a preselected coding method.

39. (Original) The communication device of claim 38, wherein the preselected coding method is constellation-multiplexed coding.

40. (Original) The communication device of claim 38, wherein the communication device is a receiver, the transmission symbol is representable by a plurality of symbol constellations, the data transformer detects the successive ones of the plurality of data symbols and extracts the selectable predetermined integer number of data bits thereby, the predetermined data bit rate is at least one of a power-of-two, a non-power of two, and a non-integer, and the preselected coding method is constellation-multiplexed coding.

41. (Original) The communication device of claim 40, wherein a received signal includes a transmission symbol and channel noise imposed thereupon, and the data transformer further comprises:

a. a noise estimator, operably connected with the data channel and governed by the controller, for estimating a noise metric associated with the transmission symbol; and

b. a sequence estimator, operably connected with the noise estimator and governed by the controller, detecting the received symbols, and the selectable predetermined integer number of data bits thereby, and using the noise metric to filter the channel noise from the received signal, extracting the transmission symbol thereby.

42. (Original) The communication device of claim 41 wherein the sequence estimator employs soft-decision decoding.

43. (Original) The communication device of claim 42, wherein the demodulator further performing a correlative-level decoding.

44. (Original) The communication device of claim 43, wherein the correlative-level decoding includes a partial-response decoding.

45. (Original) The communication device of claim 14, wherein the preselected domain comprises time domain and frequency domain; and wherein the transmission symbol is modulated using an orthogonal frequency division multiplexing technique.

46. (Original) The communication device of claim 15, wherein the preselected domain comprises time domain and frequency domain; and wherein the transmission symbol is modulated using an orthogonal frequency division multiplexing technique.

Claim 47. (Cancelled).

48. (Original) A data communication method, comprising the steps of:

a. sensing a data channel condition;

b. determining a desired variable bit-per-symbol transmission rate responsive to the condition;

c. adaptively transforming data reversibly from data bits to symbols, the transforming including:

(1) forming ones of a first selectable predetermined integer number of data bits into selected ones of a selectable integer plurality of data bit vectors,

(2) forming ones of a second selectable predetermined integer number of data bits into selected others of the selectable integer plurality of data bit vectors, and

(3) forming the symbols from the selectable integer plurality of data bit vectors; and

d. communicating the symbols at the desired variable bit- per-symbol rate, the desired variable bit-per-symbol rate being one of a power of two, a non-power of two and a non-integer.

49. (Currently Amended) A communication system communicating data bits through a data channel, comprising:

a data transformer coupled with the data channel, the data transformer transforming the data bits into a transmission symbol, the transmission symbol being composed of a selectable integer number of data bit vectors, each of the data bit vectors being composed of a selectable predetermined integer number of the data bits, the data transformer mapping a selectable number of transmission symbols into a data symbol selected from a signal constellation, the signal constellation being one of an integer

signal constellation and a power-of-two signal constellation, the selectable predetermined integer number of data bits being selected to provide a preselected average data bit transmission rate,

wherein the selectable predetermined integer number of data bits ~~is one of~~ includes a first integer number of k bits and a second integer number of k+1 bits~~, where k is an integer number of data bits~~.

50. (Original) The communication system of Claim 49, further comprising:

a controller coupled between the data channel and the data transformer, the controller sensing at least one data channel condition and compelling the data transformer to select one of the selectable integer number of data bit vectors and the selectable predetermined integer number of the data bits, responsive thereto.

51. (Previously Presented) The communication system of Claim 49, wherein the selectable predetermined integer number of data bits is adaptively selected.

Claim 52 (Cancelled).

53. (Previously Presented) The communication system of Claim 49, wherein the preselected average data bit transmission rate is a non-integer data bit transmission rate.

54. (Previously Presented) A communication system, comprising:

a. a constellation-multiplexing transmitter; and

b. a maximum-likelihood sequence estimation receiver,

wherein the maximum-likelihood sequence estimation receive selects a path through a code trellis having a minimum noise-power-inversely-weighted-squared-Euclidean distance.

Claim 55 (Cancelled).